

REMARKS

Claims 1-11 are all the claims pending in the application, of which claims 7-11 have been withdrawn. Accordingly, claims 1-6 have been examined and have been rejected under 35 U.S.C. § 102(e).

I. Preliminary Matters

The Examiner has indicated that the title of the invention is not descriptive. However, since the current title accurately describes the invention recited in the claims, i.e., a semiconductor device having a Cu interconnection, Applicant assumes the Examiner would like the “method” portion of the title removed due to the withdrawal of claims 7-11. Accordingly, Applicant has amended the title in a manner believed to overcome the objection.

Also, the Examiner has not acknowledged the drawings filed on January 22, 2004. Accordingly, Applicant respectfully requests the Examiner to indicate, in the next Office Action, whether the drawings are acceptable.

II. Rejections under 35 U.S.C. § 102(e)

The Examiner has rejected claims 1-6 under 35 U.S.C. § 102(e) as allegedly being anticipated by U.S. Publication No. 2003/0137050 to Chambers et al. (“Chambers”).

A. Claim 1

Applicant submits that claim 1 is patentable over the cited reference. For example, claim 1 recites that a density of additive metal atoms is higher in vicinities of bottom and side surfaces of a first Cu interconnection, and a density of additive silicon atoms is higher in a vicinity of a top surface of the first Cu interconnection.

The Examiner maintains that paragraphs [0026], [0032] and [0035] disclose the above features. Based on the cited paragraphs of Chambers, it appears that the Examiner maintains that the seed layer discloses the additive metal atoms, while the diffusion of Si into the interconnect layer 310 discloses the additive silicon atoms. However, the reference fails to teach that the distribution of the metal and silicon atoms will have a density distribution in the manner as recited in claim 1.

For example, as disclosed in paragraph [0032], annealing of the wafer will redistribute constituents of the seed layer and the conductive layer in a variety of ways. Further, in paragraph [0035], Chambers discloses that silicon will be diffused into the interconnect 310, but does not disclose that the density of the silicon will be highest at the top surface of the interconnect. Applicant submits that the process conditions disclosed by Chambers will not result in the same density distribution as recited in claim 1.

In view of the above, Applicant submits that claim 1 is not anticipated by Chambers, and respectfully requests the Examiner to reconsider and withdraw the rejection.

B. Claims 2-6

Since claims 2-6 are dependent upon claim 1, Applicant submits that such claims are patentable at least by virtue of their dependency.

In addition, claim 6 recites that the first Cu interconnection and the second Cu interconnection are connected together via a Cu plug covered with a barrier metal film.

On page 4 of the Office Action, the Examiner maintains that the barrier metal film is disclosed by element 300 of Chambers. However, assuming *arguendo* that the via 170, shown in Fig. 1 of Chambers, discloses a type of Cu plug between metallization layers 1 and 2 (i.e., alleged first and second Cu interconnections), Chambers fails to teach or suggest that the barrier layer 300 is provided to cover the via 170. Rather, as disclosed in the reference, the element 300 is a barrier layer that is used to prevent inter-diffusion between a plug or contact and a *bottom electrode layer* (Figs. 3-5; para. [0023]). Accordingly, Applicant submits that claim 6 is patentable over the cited reference.

III. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

AMENDMENT UNDER 37 C.F.R. § 1.111
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The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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